

1W Isolated DC-DC converter  
Fixed input voltage, unregulated single output



UL US CE CB Patent Protection RoHS



## FEATURES

- Continuous short-circuit protection
- No-load input current as low as 8mA
- Operating ambient temperature range: -40°C to +105°C
- High efficiency up to 85%
- Compact SMD package
- I/O isolation test voltage: 3k VDC
- Industry standard pin-out
- IEC62368, UL62368, EN62368 approved

*F\_XT-1WR3 series are specially designed for applications where an isolated voltage is required in a distributed power supply system. They are suitable for: pure digital circuits, low frequency analog circuits, relay-driven circuits and data switching circuits.*

## Selection Guide

| Certification | Part No.     | Input Voltage (VDC) | Output        |                           | Full Load Efficiency (%)<br>Min./Typ. | Capacitive Load(μF)<br>Max. |
|---------------|--------------|---------------------|---------------|---------------------------|---------------------------------------|-----------------------------|
|               |              | Nominal (Range)     | Voltage (VDC) | Current (mA)<br>Max./Min. |                                       |                             |
| UL/CE/CB      | F1205XT-1WR3 | 12<br>(10.8-13.2)   | 5             | 200/20                    | 78/82                                 | 2400                        |
|               | F1209XT-1WR3 |                     | 9             | 111/12                    | 79/83                                 | 1000                        |
|               | F1212XT-1WR3 |                     | 12            | 84/9                      | 79/83                                 | 560                         |
|               | F1215XT-1WR3 |                     | 15            | 67/7                      | 79/83                                 | 560                         |
|               | F1224XT-1WR3 |                     | 24            | 42/4                      | 81/85                                 | 220                         |
| --            | F1505XT-1WR3 | 15<br>(13.5-16.5)   | 5             | 200/20                    | 78/82                                 | 2400                        |
|               | F1509XT-1WR3 |                     | 9             | 111/12                    | 78/82                                 | 1000                        |
| UL/CE/CB      | F1515XT-1WR3 | 24<br>(21.6-26.4)   | 15            | 67/7                      | 79/83                                 | 560                         |
|               | F2405XT-1WR3 |                     | 5             | 200/20                    | 74/80                                 | 2400                        |
|               | F2409XT-1WR3 |                     | 9             | 111/12                    | 74/80                                 | 1000                        |
|               | F2412XT-1WR3 |                     | 12            | 84/9                      | 74/80                                 | 560                         |
|               | F2415XT-1WR3 |                     | 15            | 67/7                      | 74/80                                 | 560                         |
|               | F2424XT-1WR3 |                     | 24            | 42/4                      | 74/80                                 | 220                         |

## Input Specifications

| Item                                   | Operating Conditions |                         | Min.               | Typ.  | Max.   | Unit |     |
|--|----------------------|-------------------------|--------------------|-------|--------|------|-----|
| Input Current<br>(full load / no-load) | 12VDC input          | 5VDC output             | --                 | 102/8 | 107/-- | mA   |     |
|  |                      | 9VDC/12VDC/15VDC output | --                 | 101/8 | 106/-- |      |     |
|  |                      | 24VDC output            | --                 | 99/8  | 103/-- |      |     |
|  | 15VDC input          | 5VDC/9VDC output        | --                 | 82/8  | 86/--  |      |     |
|  |                      | 15VDC output            | --                 | 81/8  | 85/--  |      |     |
|  | 24VDC input          | 5VDC output             | --                 | 53/8  | 57/--  |      |     |
| 5VDC/9VDC/12VDC/15VDC output           |                      | --                      | 51/8               | 55/-- |        |      |     |
| 24VDC output                           |                      | --                      | 53/8               | 57/-- |        |      |     |
| Reflected Ripple Current*              |                      |                         | --                 | 15    | --     |      |     |
| Surge Voltage(1sec. max.)              | 12VDC input          |                         |                    | -0.7  | --     | 18   | VDC |
|  | 15VDC input          |                         |                    | -0.7  | --     | 21   |     |
|  | 24VDC input          |                         |                    | -0.7  | --     | 30   |     |
| Input Filter                           |                      |                         | Capacitance filter |       |        |      |     |
| Hot Plug                               |                      |                         | Unavailable        |       |        |      |     |

Note: \* Reflected ripple current testing method please see *DC-DC Converter Application Notes* for specific operation.

### Output Specifications

| Item                     | Operating Conditions            |                              | Min.                                  | Typ.       | Max. | Unit  |
|--------------------------|---------------------------------|------------------------------|---------------------------------------|------------|------|-------|
| Voltage Accuracy         |                                 |                              | See output regulation curves (Fig. 1) |            |      |       |
| Linear Regulation        | Input voltage change: $\pm 1\%$ |                              | --                                    | --         | 1.2  | --    |
| Load Regulation          | 10%-100% load                   | 5VDC output                  | --                                    | 5          | 15   | %     |
|                          |                                 | 9VDC output                  | --                                    | 3          | 10   |       |
|                          |                                 | 12VDC output                 | --                                    | 3          | 10   |       |
|                          |                                 | 15VDC output                 | --                                    | 3          | 10   |       |
|                          |                                 | 24VDC output                 | --                                    | 2          | 10   |       |
| Ripple & Noise*          | 20MHz bandwidth                 | 5VDC/9VDC/12VDC/15VDC output | ---                                   | 30         | 75   | mVp-p |
|                          |                                 | 24VDC output                 | ---                                   | 50         | 100  |       |
| Temperature Coefficient  | Full load                       |                              | --                                    | $\pm 0.02$ | --   | %/°C  |
| Short-Circuit Protection |                                 |                              | Continuous, self-recovery             |            |      |       |

Notes: \* The "parallel cable" method is used for ripple and noise test, please refer to *DC-DC Converter Application Notes* for specific information.

### General Specifications

| Item                             | Operating Conditions  |  | Min.   | Typ. | Max. | Unit    |
|----------------------------------|---|--|--|------|------|---------|
| Isolation                        | Input-output electric strength test for 1 minute with a leakage current of 1mA max. |  | 3000   | --   | --   | VDC     |
| Insulation Resistance            | Input-output resistance at 500VDC   |  | 1000   | --   | --   | MΩ      |
| Isolation Capacitance            | Input-output capacitance at 100kHz/0.1V   |  | --   | 20   | --   | pF      |
| Operating Temperature            | Derating when operating temperature $\geq 100^\circ\text{C}$ , (see Fig. 2)         |  | -40  | --   | 105  | °C      |
| Storage Temperature              |   |  | -55  | --   | 125  |         |
| Case Temperature Rise            | $T_a=25^\circ\text{C}$  |  | --   | 25   | --   |         |
| Storage Humidity                 | Non-condensing  |  | 5  | --   | 95   | %RH     |
| Reflow Soldering Temperature*    |   |  | Peak temp. $\leq 245^\circ\text{C}$ , maximum duration time $\leq 60\text{s}$ over $217^\circ\text{C}$ . |      |      |         |
| Vibration                        |   |  | 10-150Hz, 5G, 0.75mm. along X, Y and Z   |      |      |         |
| Switching Frequency              | Full load, nominal input voltage  |  | --   | 260  | --   | kHz     |
| MTBF                             | MIL-HDBK-217F@25°C  |  | 3500   | --   | --   | k hours |
| Moisture Sensitivity Level (MSL) | IPC/JEDEC J-STD-020D.1  |  | Level 1  |      |      |         |

Note:\*For actual application, please refer to IPC/JEDEC J-STD-020D.1.

### Mechanical Specifications

|                |  |
|----------------|--|
| Case Material  | Black plastic; flame-retardant and heat-resistant (UL94 V-0) |
| Dimensions     | 13.20 x 11.40 x 7.25 mm                                      |
| Weight         | 1.4g(Typ.)   |
| Cooling Method | Free air convection  |

### Electromagnetic Compatibility (EMC)

|           |     |  |
|-----------|-----|--|
| Emissions | CE  | CISPR32/EN55032 CLASS B  |
|           | RE  | CISPR32/EN55032 CLASS B  |
| Immunity  | ESD | IEC/EN61000-4-2 Air $\pm 8\text{kV}$ , Contact $\pm 6\text{kV}$ perf. Criteria B |

Note: Refer to Fig.4 for recommended circuit test.

Typical Performance Curves

Output Regulation Curve

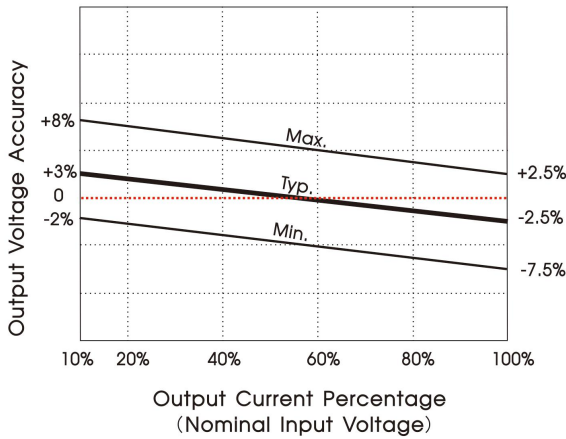


Fig. 1

Temperature Derating Curve

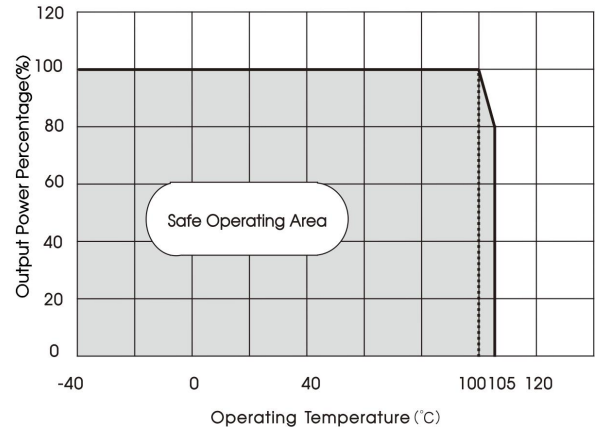
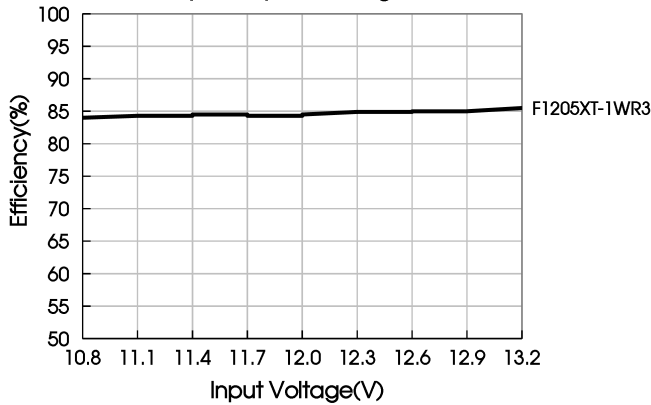
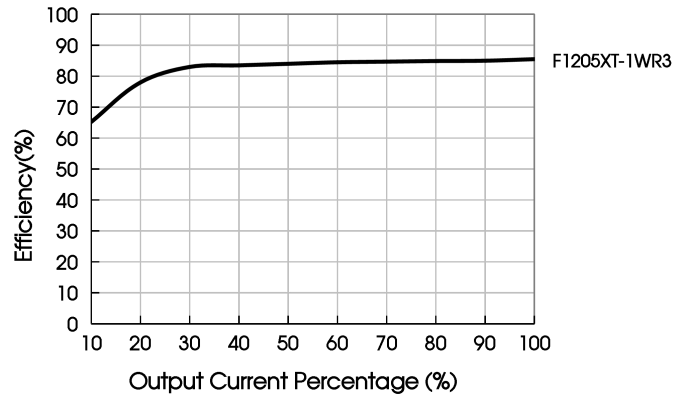


Fig. 2

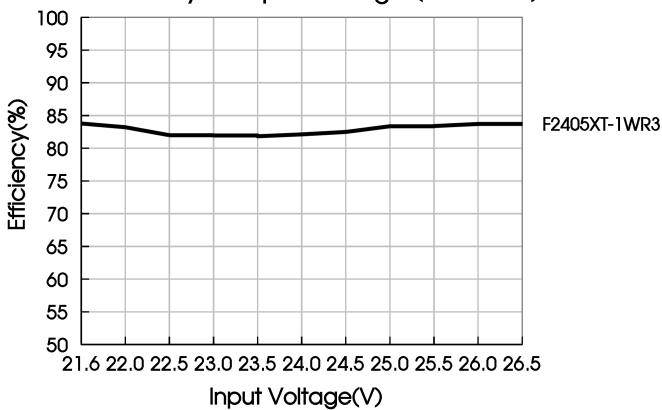
Efficiency Vs Input Voltage (Full Load)



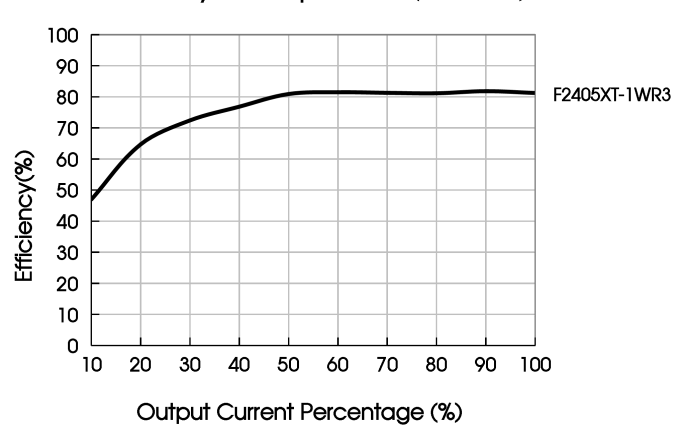
Efficiency Vs Output Load (Vin=12V)



Efficiency Vs Input Voltage (Full Load)



Efficiency Vs Output Load (Vin=24V)



Design Reference

1. Typical application

Input and/or output ripple can be further reduced, by connecting a filter capacitor from the input and/or output terminals to ground as shown in Fig.3.

Choosing suitable filter capacitor values is very important for a smooth operation of the modules, particularly to avoid start-up problems caused by capacitor values that are too high. For recommended input and output capacitor values refer to Table 1.

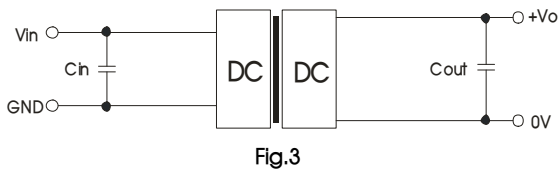


Table 1: Recommended input and output capacitor values

| Vin   | Cin       | Vo    | Cout      |
|-------|-----------|-------|-----------|
| 12VDC | 2.2μF/25V | 5VDC  | 10μF/16V  |
| 15VDC | 2.2μF/25V | 9VDC  | 2.2μF/16V |
| 24VDC | 1μF/50V   | 12VDC | 2.2μF/25V |
| --    | --        | 15VDC | 1μF/25V   |
| --    | --        | 24VDC | 1μF/50V   |

2. EMC compliance circuit

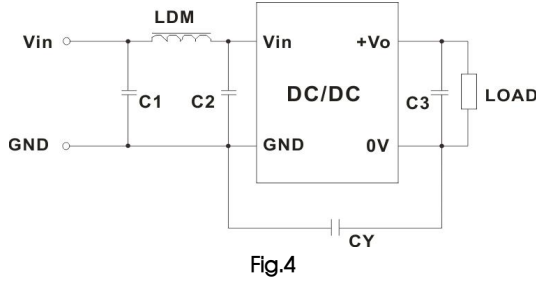


Table 2: EMC recommended circuit value table

| Emissions | C1  | 4.7μF /50V                   |
|-----------|-----|------------------------------|
|           | C2  | 4.7μF /50V                   |
|           | CY  | 270pF/3kV                    |
|           | C3  | Refer to the Cout in table 1 |
|           | LDM | 6.8μH                        |

3. For additional information, please refer to DC-DC converter application notes on [www.mornsun-power.com](http://www.mornsun-power.com)

Dimensions and Recommended Layout

THIRD ANGLE PROJECTION

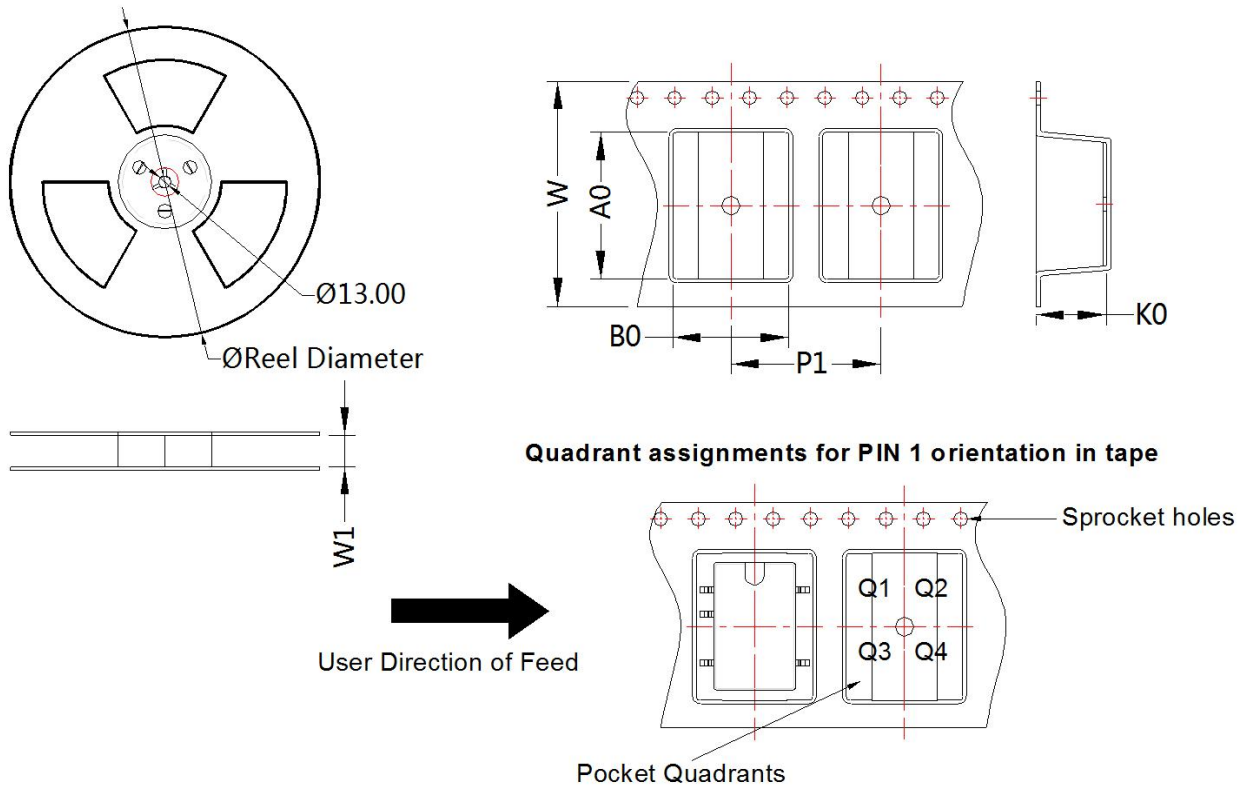
Note: Grid 2.54\*2.54mm

| Pin-Out |          |
|---------|----------|
| Pin     | Function |
| 1       | GND      |
| 2       | Vin      |
| 4       | 0V       |
| 5       | +Vo      |
| 8       | NC       |

NC: Pin to be isolated from circuitry

Note:  
Unit: mm[inch]  
Pin section tolerances: ±0.10[±0.004]  
General tolerances: ±0.25[±0.010]

Tape and Reel Info



| Device    | Package Type | Pin | SPQ | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|-----------|--------------|-----|-----|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| F_XT-1WR3 | SMD          | 5   | 500 | 330.0              | 24.5               | 13.4    | 11.7    | 7.5     | 16.0    | 24.0   | Q1            |

Notes:

1. For additional information on Product Packaging please refer to [www.mornsun-power.com](http://www.mornsun-power.com). Tube Packaging bag number: 58210024, Roll Packaging bag number: 58200054;
2. If the product is not operated within the required load range, the product performance cannot be guaranteed to comply with all parameters in the datasheet;
3. The maximum capacitive load offered were tested at input voltage range and full load;
4. Unless otherwise specified, parameters in this datasheet were measured under the conditions of Ta=25°C, humidity<75%RH with nominal input voltage and rated output load;
5. All index testing methods in this datasheet are based on our company corporate standards;
6. We can provide product customization service, please contact our technicians directly for specific information;
7. Products are related to laws and regulations: see "Features" and "EMC";
8. Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units.

MORNSUN Guangzhou Science & Technology Co., Ltd.

Address: No. 5, Kehui St. 1, Kehui Development Center, Science Ave., Guangzhou Science City, Huangpu District, Guangzhou, P. R. China  
Tel: 86-20-38601850 Fax: 86-20-38601272 E-mail: [info@mornsun.cn](mailto:info@mornsun.cn) [www.mornsun-power.com](http://www.mornsun-power.com)